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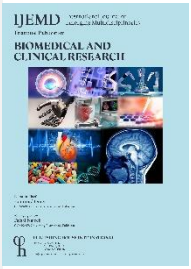

Prevalence of Endoparasites of Local and Exotic Breeds of Domesticated Chickens *(Gallus gallus domesticus)* within Kaduna Metropolis

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Abstract

The study was undertaken to determine the prevalence of endoparasites among local and exotic breeds of chickens reared and slaughtered in three Local Government Areas within Kaduna metropolis. A total of one hundred and seven (107) intact fresh intestines were randomly sourced and examined. Direct smear technique was employed to isolate endoparasites (helminths and protozoans) from each faecal sample. The result revealed that *Gongylonema ingluvicola*, a nematode had the highest prevalence rate of 79.62% in the entire male population of both local and exotic breeds sampled and 71.69% in the entire female population sampled. The result revealed the overall prevalence of endoparasites to be 58.90% (63/107) among the chickens sampled within the study area. Local breeds had a higher prevalence rate of 68.75% than the exotic breeds (44.18%), thus there was a significant difference in infection ($p \leq .05$). Other species isolated in the males and females respectively include *Ascaridia galli* (38.88%; 22.64%), *Syngamus trachea* (7.40%; 3.77%), *Strongyloides avium* (7.40%; 35.85%), *Heterakis sp.* (24.1%; 3.77%), *Raillietina sp.* (14.81%; 49.1%), *Gongylonema ingluvicola* (79.62%; 71.69%), *Hymenolepis sp.* (3.70%; 1.89%), *Davainea proglottina* (3.70%; 3.77%), *Capillaria sp.* (1.85%; 1.89%) and a protozoan, *Eimeria sp.* (3.70%; 3.77%). The study area should be expanded and molecular identification of these parasites is necessary for confirmation.

Keywords: Direct Smear; Gastrointestinal; Helminthes; Poultry; Protozoans.

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1. Introduction

Chickens are domesticated bird species belonging to the order Galliformes which are reared by humans for the purpose of meat and egg production as well as other sporting activities such as cockfighting. Poultry farming has its importance in national economy of several developing countries including Nigeria [1]. Parasitism in poultry or domesticated chickens causes reduced growth, emaciation, anaemia, reduced egg and meat production and finally mortality [2]. Endoparasites or gastrointestinal parasites makes the flock less resistant to diseases and aggravate existing disease conditions [3][4].

Good knowledge and orientation of endoparasites of domestic chickens, their species composition and predilection site help in the prompt diagnosis and treatment of infected chickens [5][6]. These endoparasites are also known as gastro-intestinal parasites because they affect the gastrointestinal tracts and reside there in infected chickens [7]. These gastrointestinal parasites are easily detectable in fresh faeces at different stages of their life cycle which include eggs, larvae and adult stages [8]. Female roundworms produce eggs that are released in the faeces of infected chickens [9]. Concurrent helminth infestations with two or more endoparasites heightens the occurrence of early chick mortality and low productivity in adult chickens [10][1]. This research was carried out to determine the prevalence of endoparasites among local and exotic breeds of chicken within Kaduna metropolis.

Materials and Methods

Study Area

The study was conducted within Kaduna metropolis, Kaduna, Kaduna state, Nigeria. Kaduna is the capital of Kaduna State which covers a total area of 46, 053 Kilometers Square and it has an average annual temperature of about 29.3°C/84.7°F. Kaduna witnesses two major seasons which are rainy season that lasts from May and ends in October and the dry season which lasts from November through to April. The vegetation type in Kaduna is of a typical Sudan Savannah type and has a population of about 6,113,503 [11]. The geographical coordinates of Kaduna are Latitude 10°20' N and Longitude 7° 45' E. The main occupation of Kaduna State inhabitants is majorly agriculture which includes commercial and subsistence farming of crops and rearing of livestock animals [11].

Sample Collection

A total of one hundred and seven (107) samples of whole intact fresh intestinal tracts were randomly collected in which sixty-four (64) samples were for the local breeds and forty-three (43) samples were the exotic breeds of chickens. These samples were sourced from three (3) different abattoirs in three (3) Local Government Areas within Kaduna metropolis between February and March, 2022. Collected chicken samples were transported in sterilized sample containers to the Zoology laboratory at Kaduna State University, Nigeria for analysis. Each of the intestinal tracts were dissected longitudinally and the faecal content was transferred into pre-labeled stool sample containers [12].

Faecal Sample Processing

The method used in this study was the Direct Smear technique. This technique was applied by incising each of the intestinal tract longitudinally to remove all its contents with the aid of flushing it with distilled water. One gram(1g) of the faecal content was transferred to a microscope glass slide then normal saline (500ml) was added in drops to dissolve it, thereafter Lugol's iodine was applied for the purpose of staining. The glass slide was placed under the binocular compound light microscope and viewed under 100x magnification (ocular lens x10 and objective lens x10) using the systematic microscopy method to view and observe the sample for the presence of endoparasites eggs and larvae as described by Murhandarwati [12]. All parasitic stages were identified using the Royal Veterinary College Diagnostic Parasitological Chart as a guide to identify parasites recovered. All adult parasites recovered were washed and rinsed in normal saline and then preserved in 10% formalin. In this study, the eggs, larvae and adult stages of the endoparasites recovered were recorded as their presence in the faecal samples indicated infection with endoparasites.

Data Analysis

Data obtained during the study was transferred into Microsoft Excel software and statistically analyzed using Chi-square test (x^2) which was used to determine the presence and absence of helminth parasites with $p \leq 0.05$ considered statistically significant for all analyses.

The prevalence rate of the endoparasites was also analyzed using the formula below:

$$P = \frac{d}{n}\ x\ 100\%$$

Where:

'P' = prevalence.

'd' = the number of individuals having an infection at a point in time.

'n' = is the number of individuals in the population at risk [13].

Results

Six nematodes (*Gongylonema ingluvicola, Ascaridia galli, Heterakis* sp., *Strongyloides avium, Capillaria sp.* and *Syngamus trachea*); three cestodes (*Raillietina sp., Hymenolepis* sp. and *Davainea proglottina*) and one protozoan species (*Eimeria* sp.) were isolated and identified. Of the one hundred and seven (107) faecal samples obtained from all categories of birds analyzed, 63 (58.90%) had helminths (Table 1). Nematodes recovered include *Gongylonema ingluvicola* with the highest prevalence rate of 79.62% in males and 71.69 in females among the two breeds of domestic chickens sampled. The total prevalence rate of infection for the entire local breed population sampled was 68.75% (44/64) and that of the exotic breeds revealed a prevalence rate of 44.18% (19/43) as seen in Table 2 and this result showed that the local breeds had the highest prevalence rate of infection thus there was a significant difference ($p \leq 0.05$). Table 3 revealed the prevalence of endoparasites in both the local and exotic breeds based on sex in which the male local breeds of chicken had higher infection rate (77.42%) than the female local breeds with (60.61%) thus there was no significant difference ($p \geq 0.05$). Also, Table 4 revealed the male exotic breeds (47.83%) had relatively

higher infection rate than the female exotic breeds (40%) of *Gallus gallus domesticus* which was statistically significant ($p \leq 0.05$).

Table 5 shows an overall prevalence of 64.81% (35/54) was found in males and 52.83% (28/53) in females respectively thus there was no significant difference in infection ($p \geq 0.05$).

Other species of endoparasites parasites recovered were *Ascaridia galli* 38.88% (in males) and 22.64% (in females), *Heterakis sp.* 24.1% (in males) and 3.77% (in females), *Strongyloides avium* 18.52% (in males) and 35.85% (in females), *Capillaria sp.* 1.85% (in males) and 1.89% (in females), *Syngamus trachea* 7.40% (in males) and 3.77% (in females), Cestode species which were *Raillietina sp.* 14.81% (in males) and 49.1% (in females), *Hymenolepis sp.* 3.70% (in males) and 1.89% (in females), *Davainea proglottina* 3.70% (in males) and 3.77% (in females) and the only protozoan species recovered was *Eimeria sp.* having a prevalence rate of 3.70% (in males) and 3.77% (in females) Tables 6 and 7.

Table 1: Overall prevalence in the sample population from the study area

Total number of samples	No. of infected chickens	No. of uninfected chickens	Overall Prevalence (%)
107	63	44	58.90

Table 2: Prevalence based on breed of chicken

Breeds	No. of chickens examined	No. of chickens infected	No. of Chickens uninfected
Local breed	64	44 (68.75%)	20 (31.25%)
Exotic breed	43	19 (44.18%)	24 (55.81%)
Total	107	63 (58.90%)	44 (41.12%)

X^2 =9.92063492P=0.00163(P < .05)

Table 3: Prevalence based on sex in the local breeds of chicken sampled

Sex	No. of chickens examined	No. of chickens infected	No. of chickens uninfected
Local Male	31	24 (77.42%)	7 (22.58%)
Local Female	33	20 (60.61%)	13 (39.39%)

X^2=0. 36363636P= 0.54649 (p>.05)

Table 4: Prevalence based on sex in the exotic breeds of chickens sampled

Sex	No. of chickens examined	No. of chickens infected	No. of chickens uninfected
Exotic Male	23	11 (47.83%)	12 (52.17%)
Exotic Female	20	8 (40%)	12 (60%)

X^2= 9.5 P= 0.00205 (p< .05)

Table 5: Prevalence based on sex of the total population infected in both local and exotic breeds

Sex	No. of chickens examined	No. of chickens infected	No. of chickens uninfected
Male	53	35 (64.81%)	18(33.96%)
Female	54	28 (52.83%)	26 (48.15%)

X^2= 0.777777778 p Value= 0.377821637 (p> .05)

Table 6: Prevalence of Helminths and Protozoan Parasites in Males (n = 54)

Parasite Species identified	Egg (L+E)	Larvae (L+E)	Adult (L+E)		Total Prevalence (%)
Ascaridia galli	11+0	1+0	9+0	21	38.88
Gongylonema ingluvicola	38+5	0	0	43	79.62
Heterakis sp.	6+0	7+0	0	13	24.1
Syngamus trachea	4+0	0	0	4	7.40
Raillietina sp.	1+1	1+0	5+0	8	14.81
Strongyloides avium	3+1	4+2	0	10	18.52
Hymenolepis sp.	2	0	0	2	3.70
Davainea proglottina	1+1	0	0	2	3.70
Eimeria sp.	1+1	0	0	2	3.70
Capillaria sp.	0+1	0	0	1	1.85

***Keys**:*
(L+E) = no. in Local Breed + no. in Exotic Breed. % =Percentage.

Table 7: Prevalence of Helminths and Protozoan Parasites in Females (n = 53)

Parasite Species Identified	Egg (L+E)	Larvae (L+E)	Adult (L+E)	Total	Prevalence (%)
Ascaridia galli	1+0	2+0	9+0	12	22.64
Gongylonema ingluvicola	33+5	0	0	38	71.69
Heterakis sp.	0	2+0	0	2	3.77
Syngamus trachea	2+0	0	0	2	3.77
Raillietina sp.	1+0	1+0	24+0	26	49.1
Strongyloides avium	7+1	10+1	0	19	35.85
Hymenolepis sp.	1+0	0	0	1	1.89
Davainea proglottina	1+1	0	0	2	3.77
Eimeria sp.	1+1	0	0	2	3.77
Capillaria sp.	0	0+1	0	1	1.89

Keys:
(L+E) = no. in Local Breed + no. in Exotic Breed. % = Percentage

Discussion

The study was carried out using the direct smear technique which is widely used for the effective recovery of parasite's eggs, larvae and adult stages found in infected chickens [12] to determine the prevalence of endoparasites of local and exotic breeds of chickens from three (3) Local Government Areas in Kaduna state, Nigeria. Domestic chickens feed on a wide variety of food substances such as insects, grains, fruits etc which may harbor infective stages of parasites thus predisposing them to parasitic infection especially with endoparasites [14]. From the results obtained during this study, the overall prevalence was established as 58.90% and this is greatly higher than 28.6% recorded by Inuwa *et al*. [14] in Jalingo, Taraba State and also slightly higher than 42.5% recorded by Jegede *et al*. [15] in Gwagwalada, Abuja and is greatly lower than 96.3% reported by Fakae and Paul [16] in Nsukka, Enugu state; 92.6% by Mikail and Adamu [17], 82.3% by Negbenebor and Ali, [18] and 81.5% by Junaidu *et al.* [19]. It was also observed in this study that higher prevalence of infection with endoparasites was found among the local breeds of chickens than the exotic breeds and which may be due to their free-roam life style. As they are not in confinement, they come in contact with the egg stages of some endoparasites within the environment and this is in agreement with the findings of Jegede *et al*. [15] who also reported higher prevalence among the local breeds of chickens. Low prevalence was found among the exotic breeds and this may be because these chickens are kept in controlled environment with adequate managerial practices where they are been kept. Through free range lifestyle, local chickens satisfy their nutrient requirements by seeking for food in soils which might be contaminated and also by feeding on other organisms such as worms, insects and infected humans and animals wastes [20]. These organisms that are a source of food to these birds are also vectors carrying varying stages of development of parasitic helminths and protozoans as isolated in this present study [21]. Conversely, the lower prevalence recorded in the exotic breeds as compared to the local breeds suggests that the birds are from a controlled setting where their life style is controlled and their choice of meals is decided by their care taker as such, these birds only come in contact with these parasites when they feed on insects that wandered into their cages or seasoned poor hygiene practices of their caretaker [22]. This finding is in agreement with the findings of Kamal *et al*. [23] who also recorded low prevalence among the

exotic breeds. Male chickens had higher prevalence than female chickens in this study which may be due to the fact that male chicken go in search of food and mate thereby coming in contact with the infective stages of endoparasites or gastro-intestinal parasites. This finding is also in agreement with the findings of Negbenebor and Ali [18] who also recorded higher prevalence among the male chickens. This study recorded Eimeria sp. as the only protozoan parasite recorded in this study having a prevalence rate of 3.70% in males and 3.77% in females. About nine (9) helminths (six nematodes and three cestodes) were recorded in this study in both male and female chickens which may be due to the abundance of the intermediate host of these endoparasites within the study area. This result is in accordance with the findings of Edosomwan and Igetei [13] who recorded the presence of *Gongylonema ingluvicola* nematode in both male and female chickens. *Strongyloides avium* having a prevalence rate of 35.85% was seen to have the second highest infection rate among the chickens sampled.

2. Conclusions

In the present study, six nematodes (*Gongylonema ingluvicola*, *Ascaridia galli*, *Heterakis* sp., *Strongyloides avium*, *Capillaria sp.* and *Syngamus trachea*); three cestodes (*Raillietina sp.*, *Hymenolepis* sp. and *Davainea proglottina*) and one protozoan species (*Eimeria* sp.) were isolated and identified. The overall prevalence of this study was established to be 58.90%. Local breeds had higher prevalence of 68.75% than the exotic breeds with 44.18%. Male chickens had higher prevalence rate of infection (64.81%) than female chickens (52.83%). Therefore, the study has shown that endoparasites are to an extent highly prevalent and infect chickens within the study area and measures should be put in place in order to avoid more infections with endoparasites or gastro-intestinal parasites (helminths and protozoans) within the study area. Expanded study of study area and molecular identification of these parasites are recommended.

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